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CASE REPORT

ADVANCED

CLINICAL CASE: TECHNICAL CORNER

Innovative Guide Extension Catheter Trapping Technique to Retrieve a Lost Stent From a Coronary Artery

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ABSTRACT

A stent that was being implanted in the left circumflex artery, to treat an iatrogenic dissection, became dislodged at the ostial left circumflex artery on a previously deployed stent implanted for the treatment of a distal left main bifurcation stenosis. We describe here a novel technique to retrieve the device safely. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2022;4:411-414) © 2022 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 79-year-old man activated the emergency medical system 3 hours after persistent thoracic discomfort. At the first contact, the blood pressure was 135/85 mm Hg, the heart rate was 55 beats/min, and the oxygen saturation was 99%. He had no signs of congestion.

LEARNING OBJECTIVES

- To understand the interactions between wires, stent, and guiding catheter during the attempts to retrieve a lost stent from a coronary artery.
- To illustrate different strategies to remove lost stents from a coronary artery.
- To show a never before published, safe, and advantageous guide extension trapping technique to retrieve dislodged stents.

MEDICAL HISTORY

He was dyslipidemic and a former smoker, without other remarkable diseases.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included aortic dissection and acute myocardial infarction.

INVESTIGATIONS

On first medical contact, the electrocardiogram was indicative of an inferior ST-segment elevation myocardial infarction, which warranted referral of the patient to our catheterization laboratory. The echocardiogram showed a 50% left ventricle ejection fraction with an inferior wall hypokinesia. Coronary angiography revealed subtotal stenosis of the mid right coronary artery, 80% stenosis of the ostial left anterior descending (LAD) artery and of the proximal left circumflex (LCx) artery, and 50% stenosis of the distal left main (LM).

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

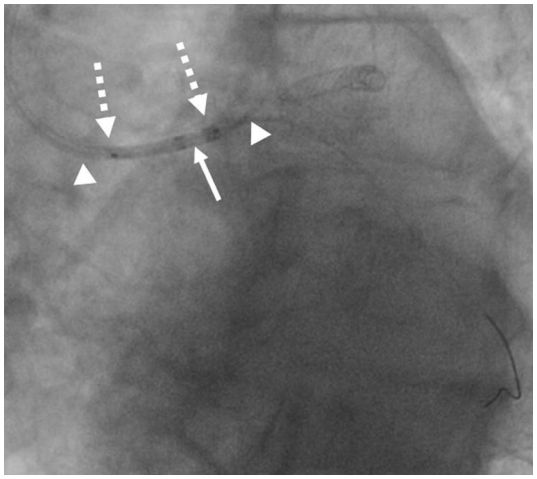
DES = drug-eluting stent
LAD = left anterior descending
LCx = left circumflex
LM = left main
NC = noncompliant
PCI = percutaneous coronary

MANAGEMENT

Before the procedure, the patient received 250 mg of intravenous lysine acetylsalicylate and 180 mg of ticagrelor. The primary percutaneous coronary intervention (PCI) was performed with direct stenting of the mid right coronary artery. After the procedure, the patient was asymptomatic, with normalized electrocardiogram. Three days later, during a heart team meeting, it was decided to complete the revascularization percutaneously in consideration of the patient's age, the recent ST-segment elevation myocardial infarction, and the SYNTAX score (=22). The LM was engaged with an Extra Back Up 3.5 6-F guiding catheter. The LM bifurcation was treated according to the Inverted-T stenting technique: after predilation of both branches, a 2.0 × 18 mm drug-eluting stent (DES) was implanted at the ostial LCx. Subsequently, 2 overlapping DESs, 3.0 × 22 mm and 3.5 × 30 mm, were placed from the proximal LAD to the ostial LM. Postdilations were performed with a 3.5-mm noncompliant (NC) balloon in the LAD stent, with a 4.5-mm NC balloon in the LM and, after rewiring, with a 3.0-mm NC balloon in the LCx. The PCI was guided by intravascular ultrasonography. The final angiography showed a type B dissection at the distal edge of the DES in the LCx; as a result, it was decided to deploy another stent (2.0 × 26 mm) to cover the dissection. However, the DES became dislodged from the balloon of the delivery system and was stuck in the previous stent struts at the ostial LCx, remaining floating in the LM with the proximal segment of the device in the guiding catheter. The wire was still inside the stent. First, a guide extension Guidion Hydro 6-F (Interventional Medical Device Solution) was advanced on the LCx wire, just behind the stent. Then, a low-profile 1.0 × 8-mm monorail balloon was loaded on the wire and pushed into the undeployed stent. The guide extension was used to encapsulate the stent with the support of the low-profile balloon, and subsequently the small balloon was used to perform multiple predilations. After this, a 2.0 × 18 mm NC balloon was positioned in the lost stent and inflated at 12 atm to entrap the DES in the guide extension catheter (**Figure 1**). Finally, the inflated balloon and the guide extension were pulled outside together, allowing successful retrieval of the lost stent (**Figures 2 and 3,** Video 1). The guiding catheter and the wire remained in site, and they were used to perform more predilations of the ostial LCx with the 3.0-mm NC balloon. The LCx dissection was stented with a 2.0 × 18 mm DES. Finally, the LM stent was postdilated with a 4.5-mm NC balloon (proximal optimization technique). During the procedure the patient was in a hemodynamically stable condition, asymptomatic, without signs of ischemia. The final angiographic result was excellent.

Two days after the PCI, the patient was discharged alive and free of angina.

FIGURE 1 The System During Retrieval



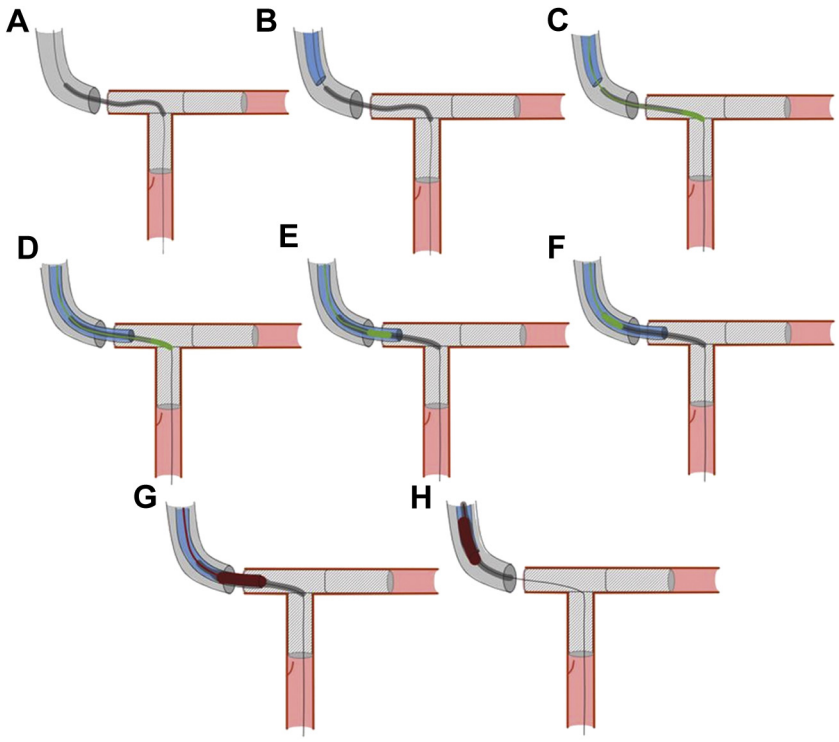
The dislodged stent **(arrowheads)** entrapped in the guide extension **(arrow)** with the NC balloon inflated **(dashed arrows)**.

DISCUSSION

Stent loss is a rare complication during PCI.[1] Risk factors are proximal vessel tortuosity, lesion location on a bend, and severe calcifications.[1]

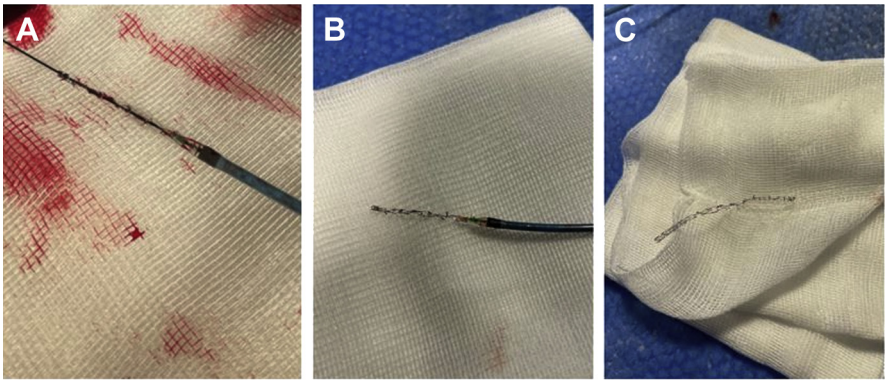
Different algorithms have been proposed in case of coronary stent loss, describing 2 possible scenarios according to the presence or absence of the guidewire inside the lost stent.[2,3] If the guidewire is in the stent, the simplest strategy is to introduce, through the stent, a low-profile balloon, which is inflated and withdrawn along with the stent into the guiding catheter (small balloon technique).[4] Another strategy, if the guidewire is in the stent, is to implant the stent in the coronary segment where it was lost. However, this should not be performed if the nominal stent diameter is smaller than the reference vessel diameter. An alternative approach is to trap the lost stent in a guide extension with a 2.0-mm semicompliant balloon positioned on a second guidewire that is advanced in the distal vessel parallel to the lost

FIGURE 2 **Guide-Extension Trapping Technique**



(A) The dislodged stent. **(B)** The guide extension was advanced just behind the stent. **(C)** A low-profile balloon was pushed in the lost stent. **(D)** The stent was encapsulated with the guide extension. **(E, F)** The small balloon was used to perform multiple predilations. **(G)** A 2.0-mm NC balloon was inserted in the stent and inflated at 14 atm. **(H)** The inflated balloon, the guide extension, and the entrapped stent were retrieved.

FIGURE 3 **Inflated Balloon, Guide Extension, and Entrapped Stent**



(A) The entrapped stent in the guide extension with the balloon inflated on the wire. **(B)** The same system out of the wire. **(C)** The dislodged stent after the removal from the guide extension.

device. However, the success of this technique is strictly dependent on the placement of a second wire in the distal vessel, which is not always possible because of the entrapped device in the coronary artery. Furthermore, all of the wires are withdrawn from the vessel with this maneuver. The same issues are encountered with the twisting wire technique[5] or the loop snare technique.[6] In both cases, the wires, and occasionally also the guiding catheter, are necessarily removed.

In this clinical case, a novel guide extension catheter trapping technique was used to retrieve a lost stent. This method is feasible if the wire remains through the stent. Advancement of a low-profile balloon in the stent before an attempt to encapsulate it with the guide extension is useful to increase the support and to make the mother-in-child coaxial with the undeployed device. Furthermore, entrapment of the stent in the guide extension with the inflation of a 2.0-mm NC balloon from the inside of the device allows the application of more force to the struts during the retrieval, compared with what the classic small balloon technique can afford. Another advantage of this new technique is that after the stent removal, the wire remains in the distal vessel and the guiding catheter is still engaged at the ostium. This could be advantageous if there is a distal vessel complication that needs to be treated.

The degree to which this technique can be implemented depends on the possibility to reach and encapsulate the stent with guide extension, in particular in case of proximal vessel tortuosity or calcification, or if the stent is dislodged in the distal artery.

FOLLOW-UP

At 1 month of follow-up, the patient is in stable condition and asymptomatic.

In conclusion, coronary stent loss is a rare but sometimes harmful complication. Trapping the lost stent from within, with an NC balloon into a guide extension catheter, is a feasible technique to overcome this complication and has some advantages compared with previous published strategies. There may be some difficulties in implementing this technique if the proximal vessel is tortuous or calcified, or if the stent is dislodged in the distal artery.

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KEY WORDS complex percutaneous coronary intervention, coronary artery disease, coronary stent retrieval, guide-extension catheter, percutaneous coronary intervention complications, stent loss

APPENDIX For a supplemental video, please see the online version of this article.